Armed Forces College of Medicine

AFCM

Innate Immunity

(Part 3&4)

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COMPONENTS & REACTIONS OF INNATE IMMUNITY

Mechanical & Chemical barriers

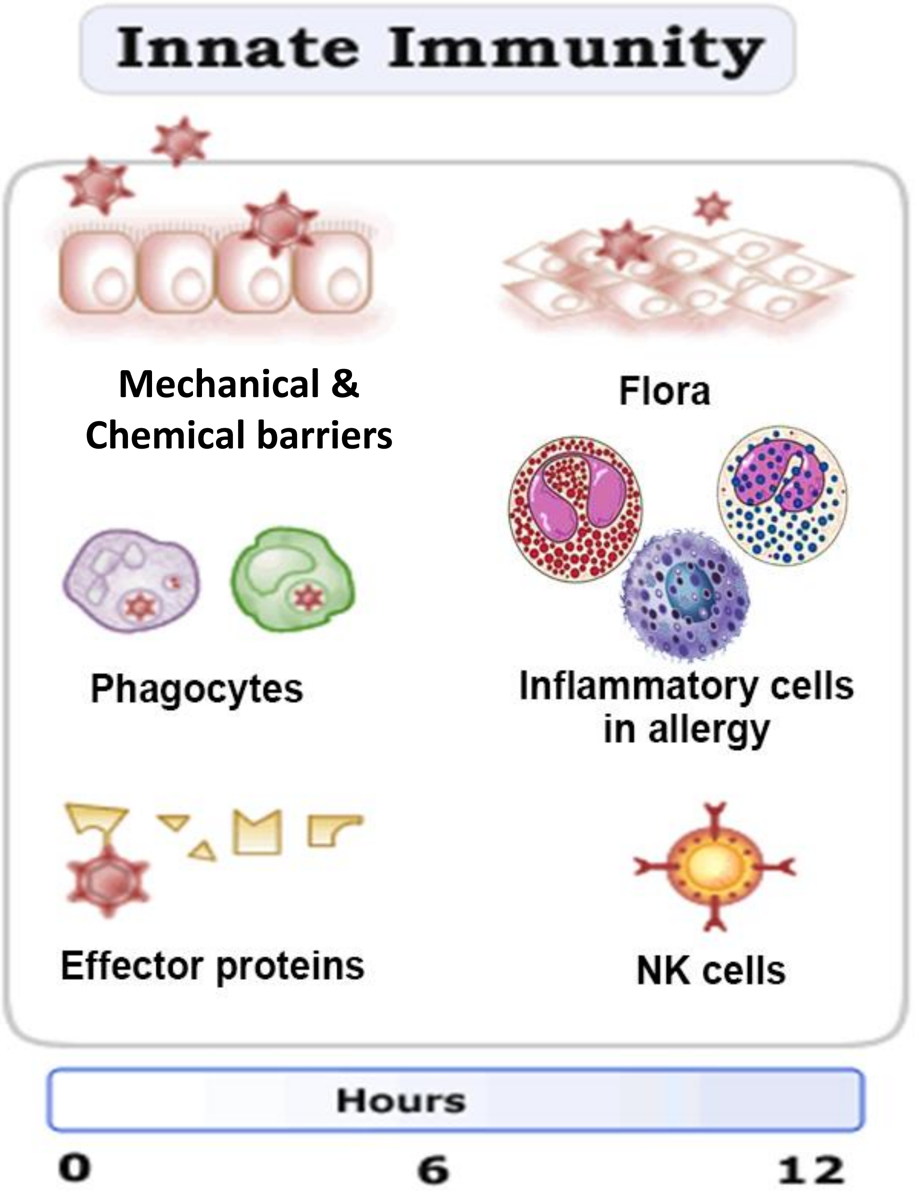
Normal Microbial flora

Inflammation

Phagocytes & Phagocytosis

Inflammatory cells involved in allergy

Circulating effector proteins



V) Circulating effector proteins

Complement

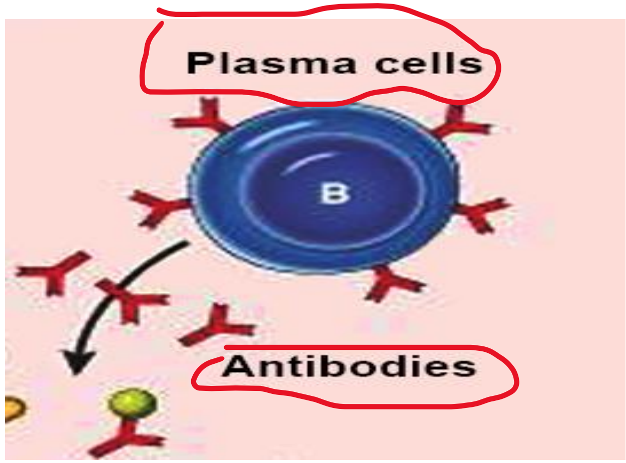
2C

Cytokines

Acute phase proteins

2A

~~**Antibodies**~~



Complement

➲ Site

Blood & tissue fluids

➲ Characters

Complement proteins (C1-C9) circulate in **inactive** form

↓

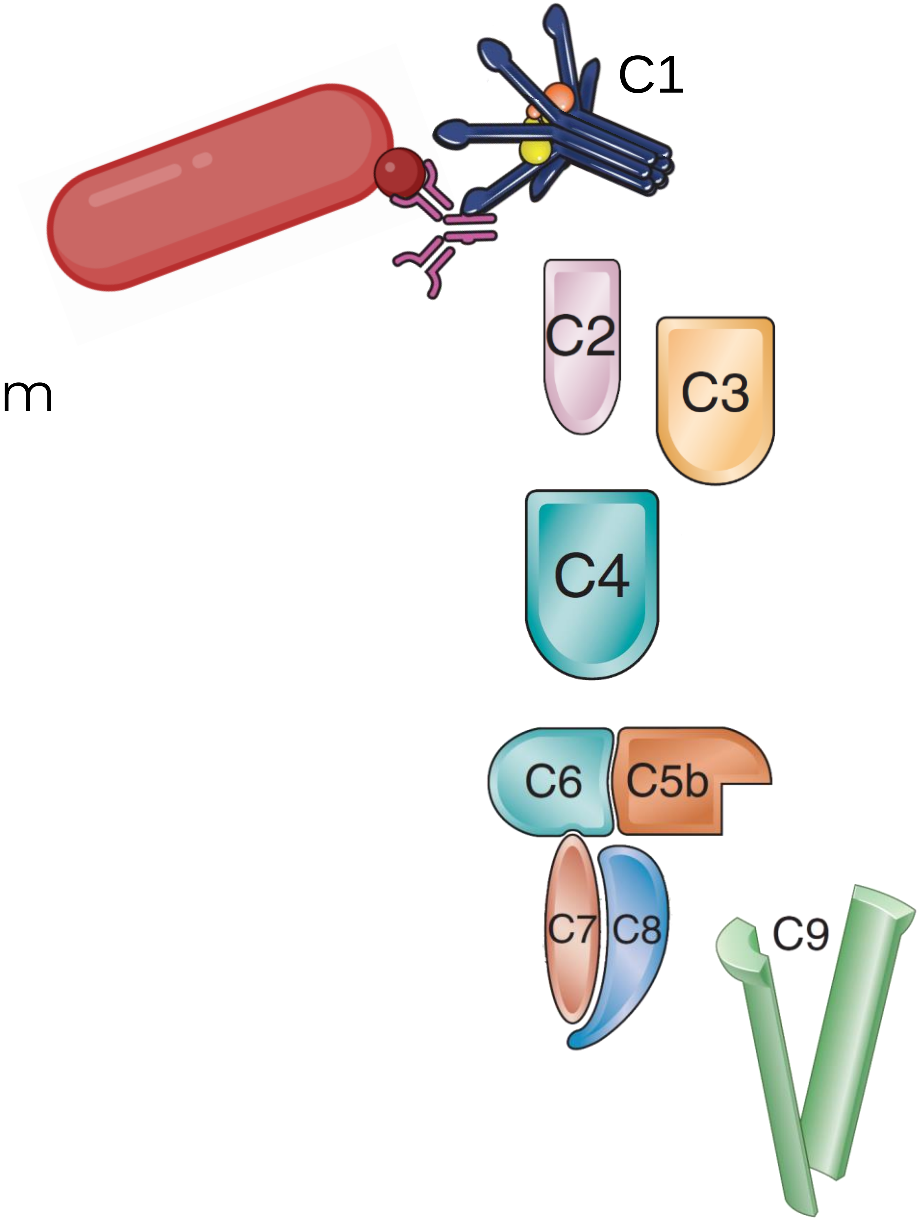
Activated **directly by microbes**

➲ Functions

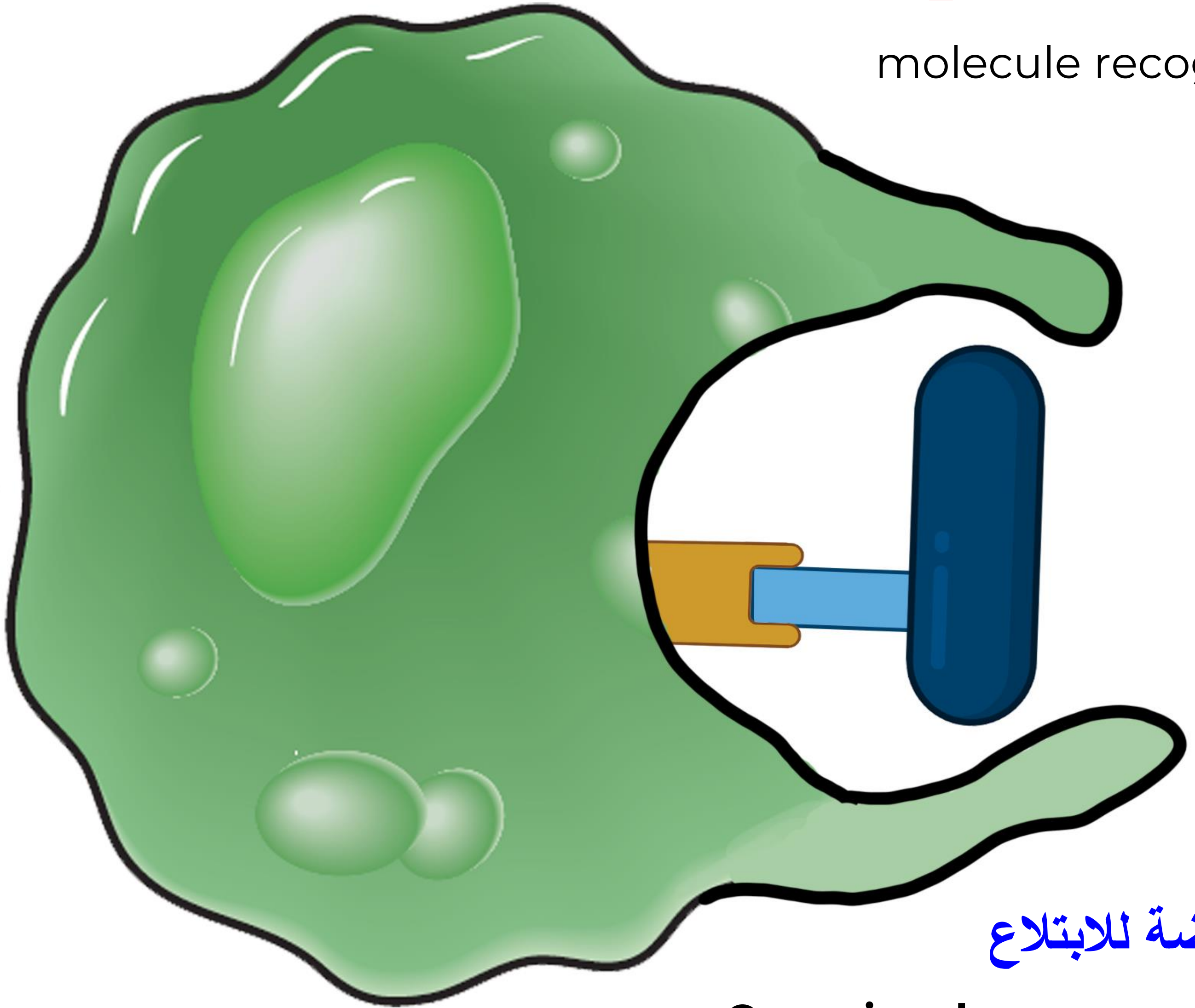
1-Direct lysis of microbe (cytolysis)

2-Recruitment of leukocytes : inflammation

3-Enhance phagocytosis (opsonization)



Opsonization (enhancement of phagocytosis)



Opsonin الموصلاتي

molecule recognized by **receptor on phagocytes**

Ex:-

① Complement

② Ab

الموصلاتي يجعل الميكروب اكثر عرضة للابتلاع

Organism becomes more susceptible to phagocytosis

Cytokines of innate immunity

A Proinflammatory cytokines

IL =Interleukin

1) TNF-α (tumor necrosis factor), معامل نخرالسرطان
2) IL1
3) IL 6
4) IL-8

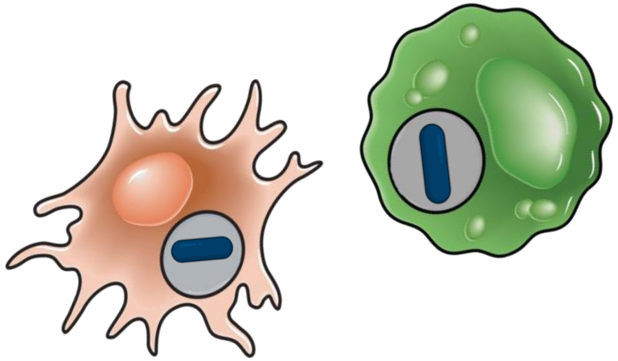
C Type I Interferon: α and β

Main antiviral cytokine

Proinflammatory cytokines

TNF α (tumor necrosis factor-α), IL1 & IL6

➲ Source Activated **macrophages & dendritic cells**



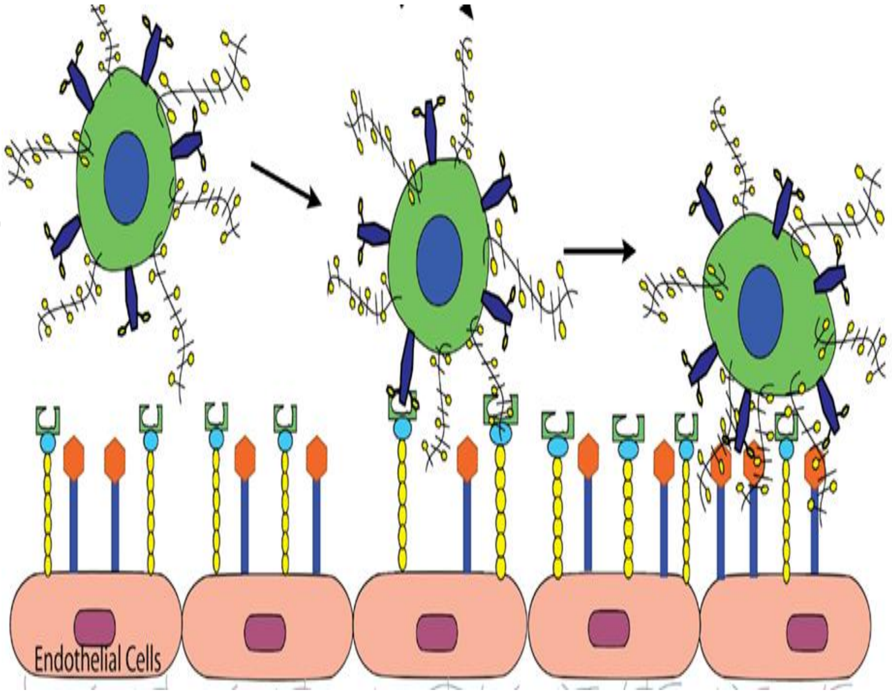
➲ Function

1) *Local inflammation*

↑ **expression** of **adhesion molecules** on **endothelial cells** & leukocytes (mainly neutrophils)

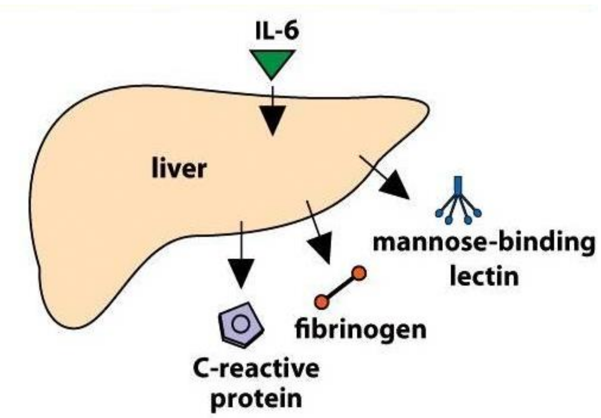
↓

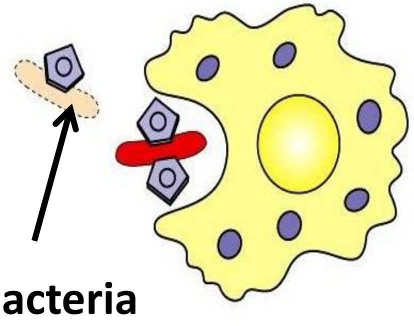
Recruitment to site of infection

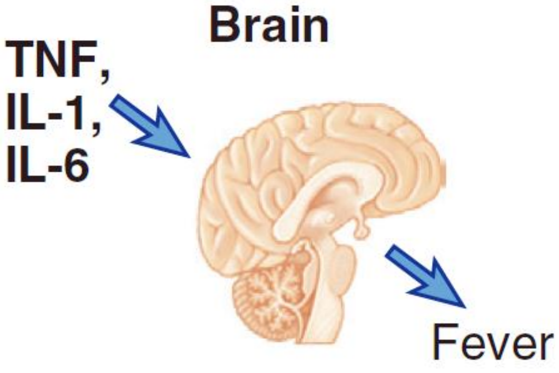


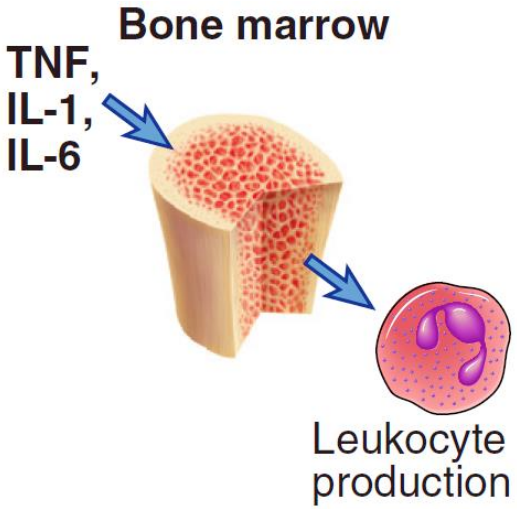
2) Systemic protective effects (LB)

On Liver	The 3 cytokines induce synthesis of **acute phase proteins** **e.g Mannose binding lectin** ↓ Bind to microbes { **enhance phagocytosis (opsonins)** **activate complement**
On brain	**Fever**









IL-8

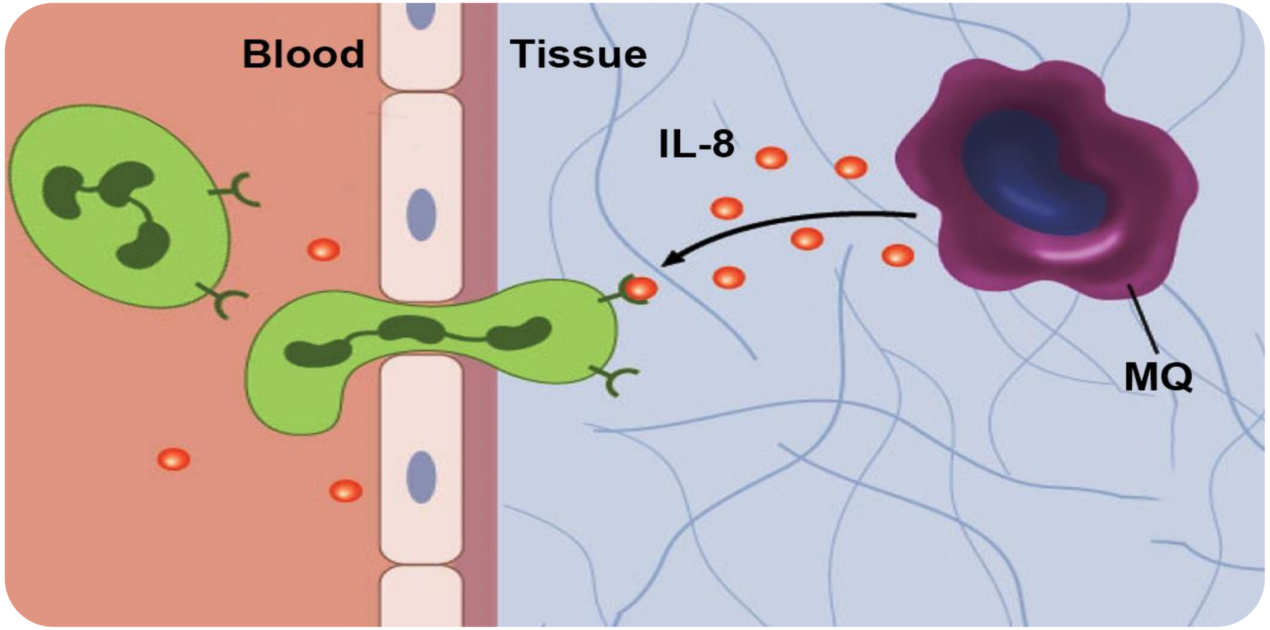
Source As proinflammatory cytokines

Function

Induce chemotaxis(**chemical attraction of leukocytes)**

↓

Recruit leukocytes from blood into sites of infection



Type I Interferon (IFN) : IFN α and β

Interfere with viral replication

➲ Source

synthesized by virus infected cells

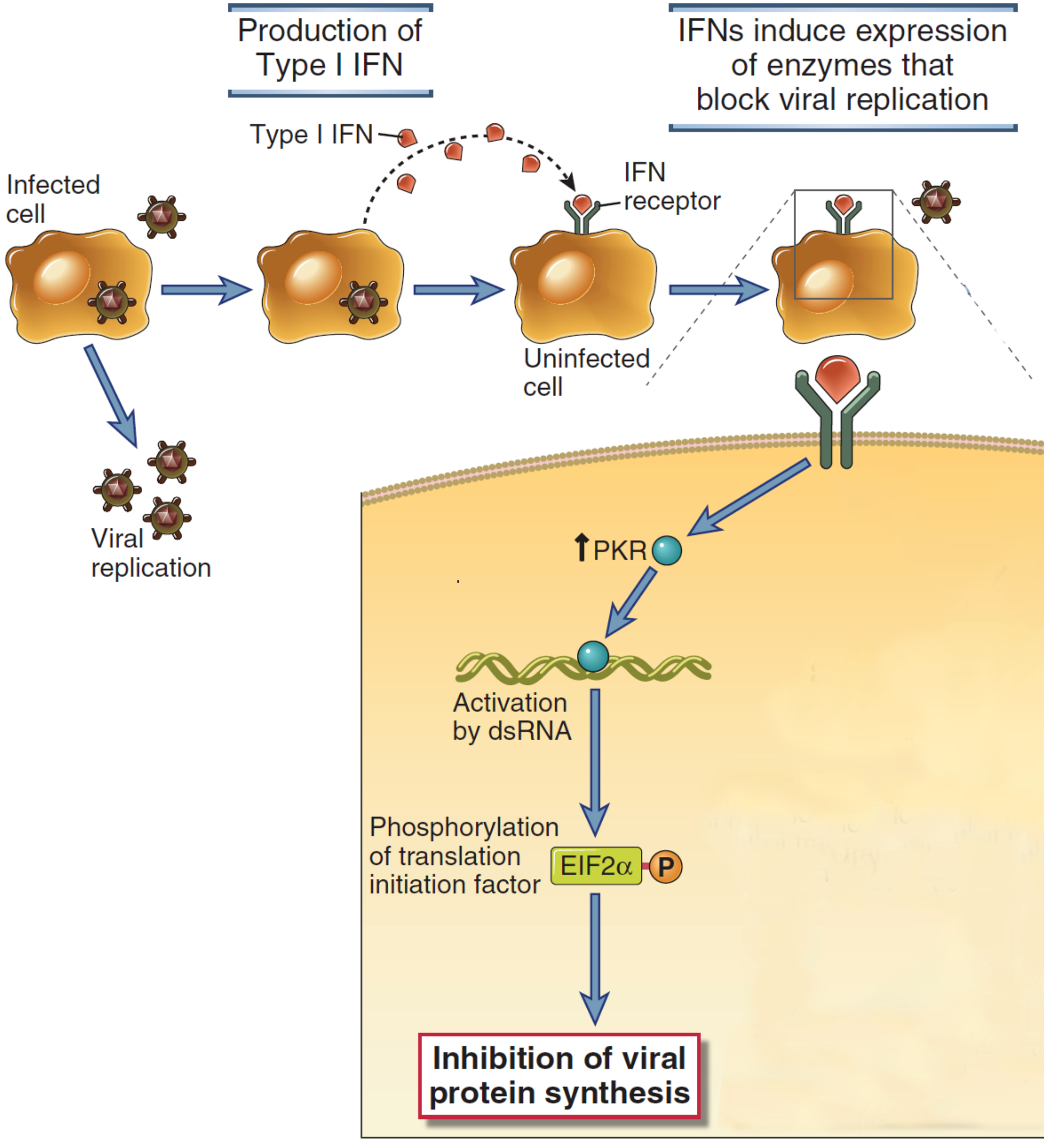
➲ Function

Main antiviral cytokine that acts only on local cells

⊖ *Viral replication*

↓ **(down regulation) protein synthesis:**

necessary for viral replication


Production of Type I IFN
IFNs induce expression of enzymes that block viral replication
Type I IFN
Infected cell
IFN receptor
Uninfected cell
Viral replication
↑PKR
Activation by dsRNA
Phosphorylation of translation initiation factor
EIF2α
P
Inhibition of viral protein synthesis

Main Components of Immune system

I) Tissues (Organs)

1ry Lymphoid organs

Bone marrow

Thymus

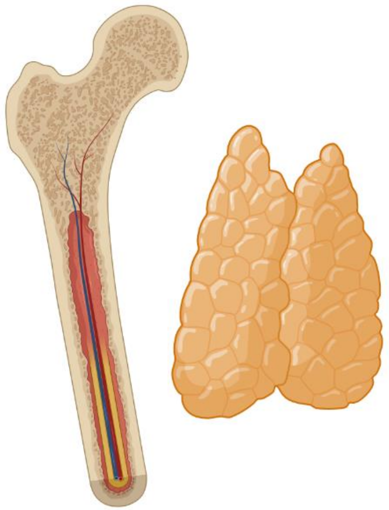
2ry Lymphoid organs

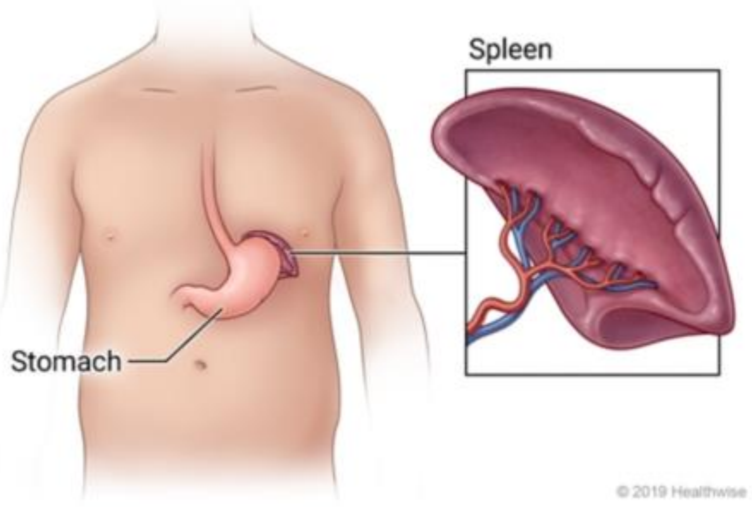
Lymph nodes

Spleen

II) Cells

III) Circulating effector proteins (2C & 2A)



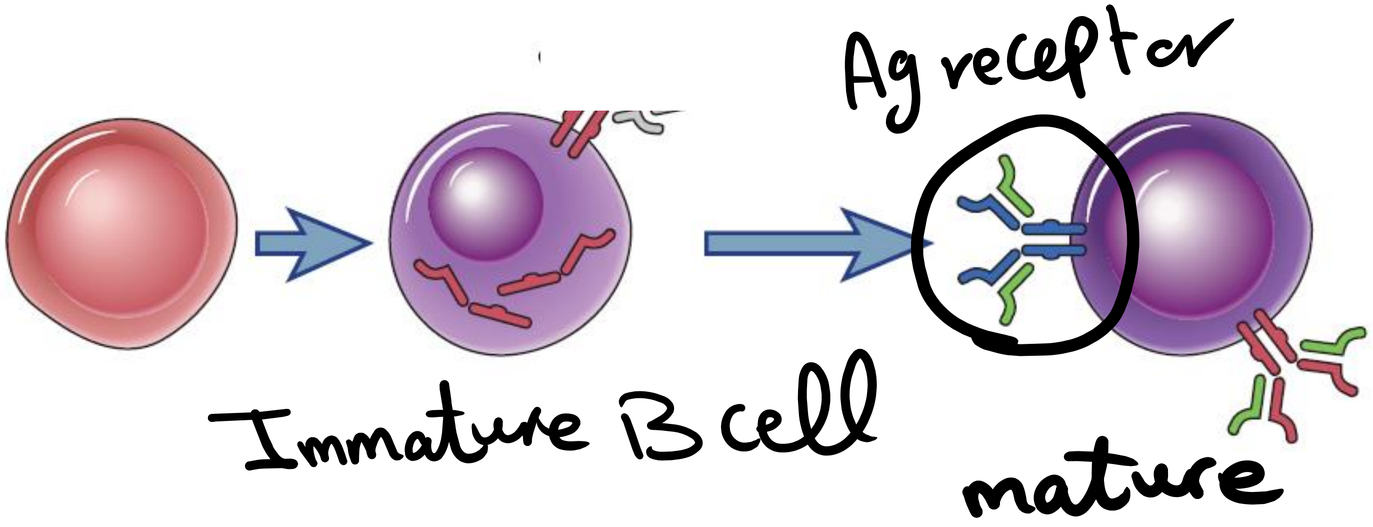


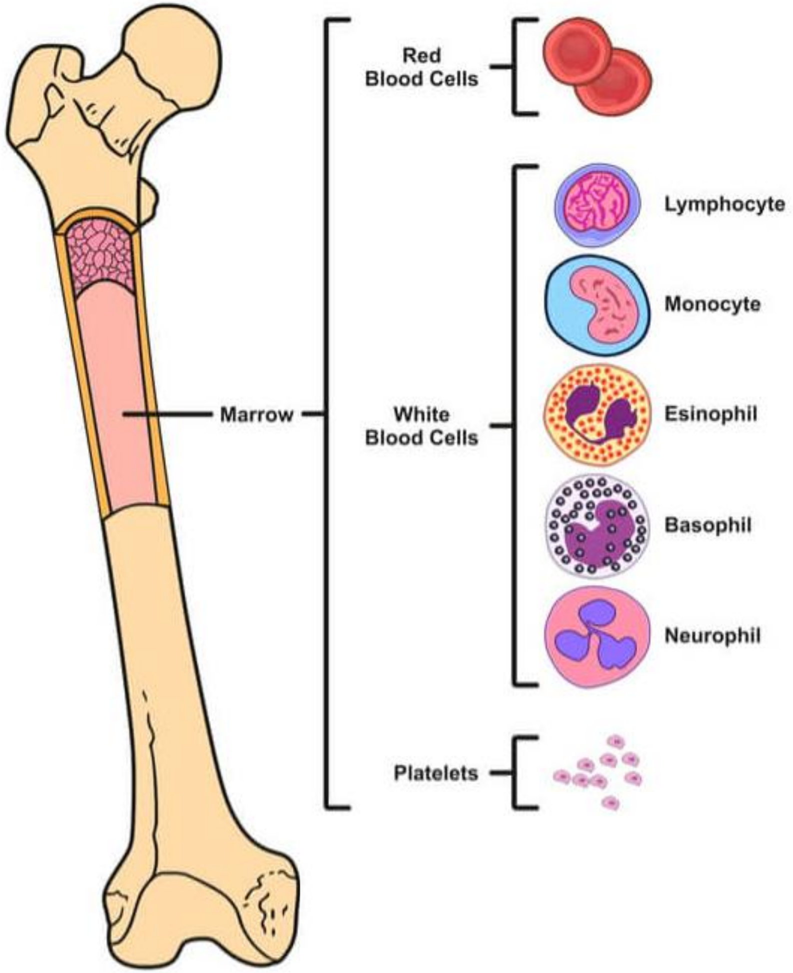
ORGANS OF THE IMMUNE SYSTEM

I) 1ry (Central) Lymphoid Organs

A) Bone marrow

- **Generation & development of all immune cells**
- **Maturation of B cells** (expression of Ag receptor)



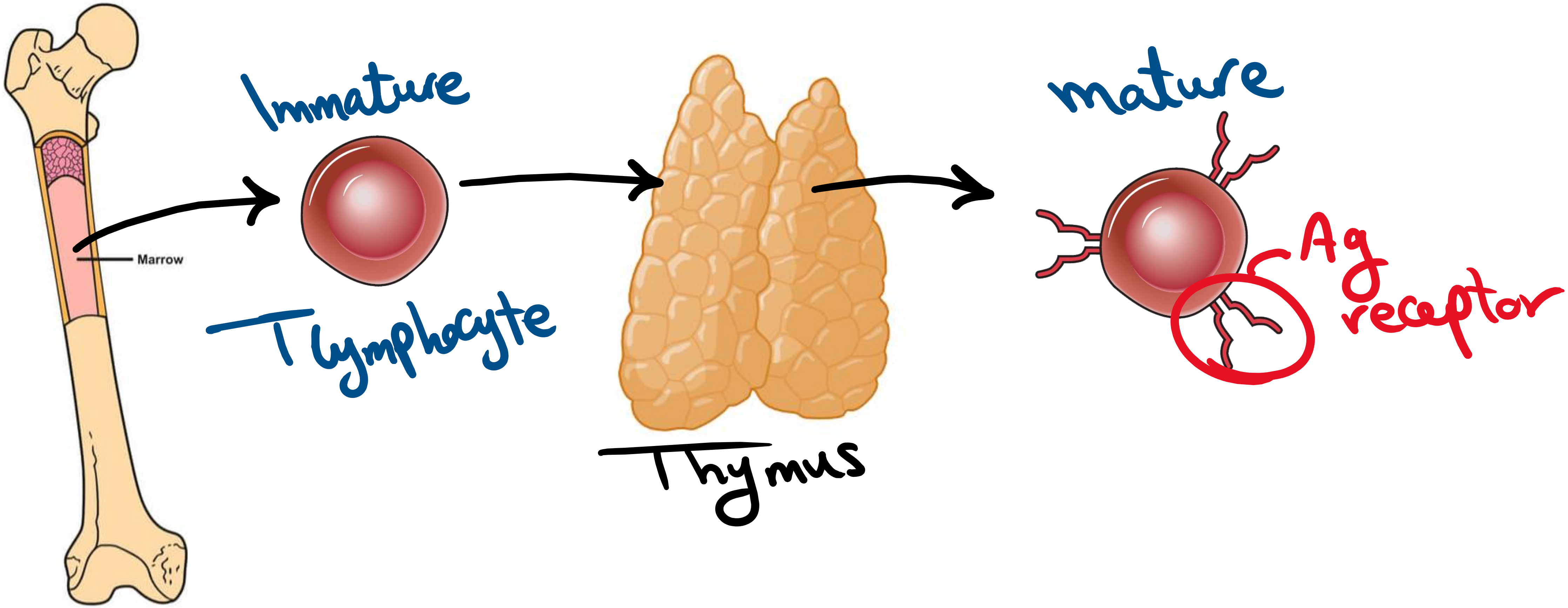


ORGANS OF THE IMMUNE SYSTEM

I) 1ry (Central) Lymphoid Organs

B) Thymus

Maturation of T lymphocytes (expression of Ag receptor)

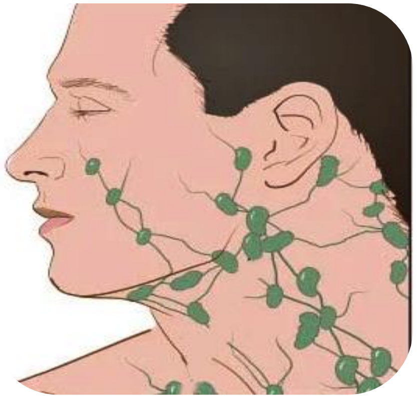


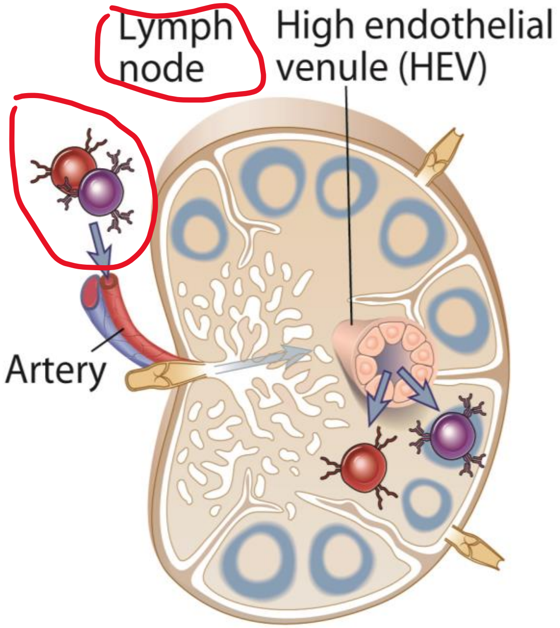
Mature B & T lymphocytes exit 1ry lymphoid organs & enter blood

↓

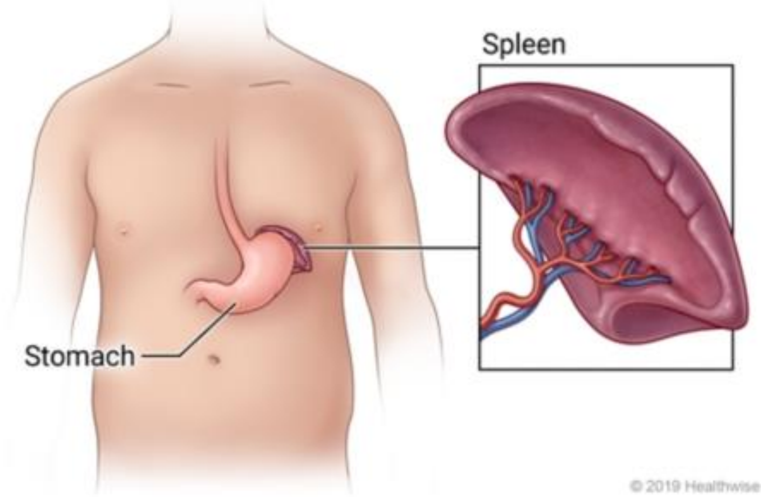
Migrate to 2ry lymphoid organs

- Spleen
- Lymph nodes





Mature e T and B cells migrate into secondary lymphoid tissues: initiation of adaptive immune responses



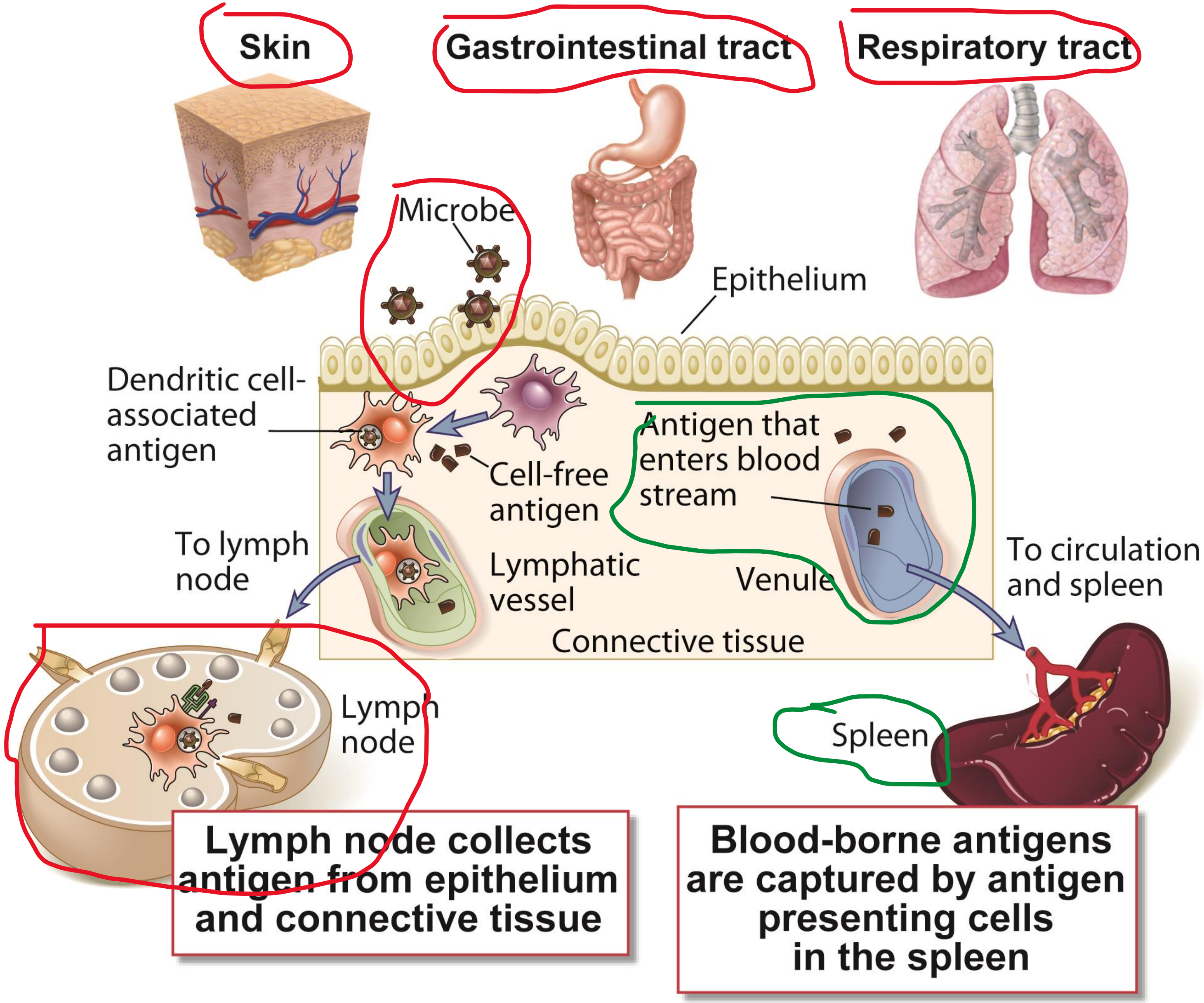
II) 2ry (peripheral) lymphoid organs

Lymph node

1) **Concentrating microbes** entering **tissues**
(Tissue filter)

Spleen

1) **Concentrating microbes** entering **blood**
(blood filter)



Lymph node collects antigen from epithelium and connective tissue

Blood-borne antigens are captured by antigen presenting cells in the spleen

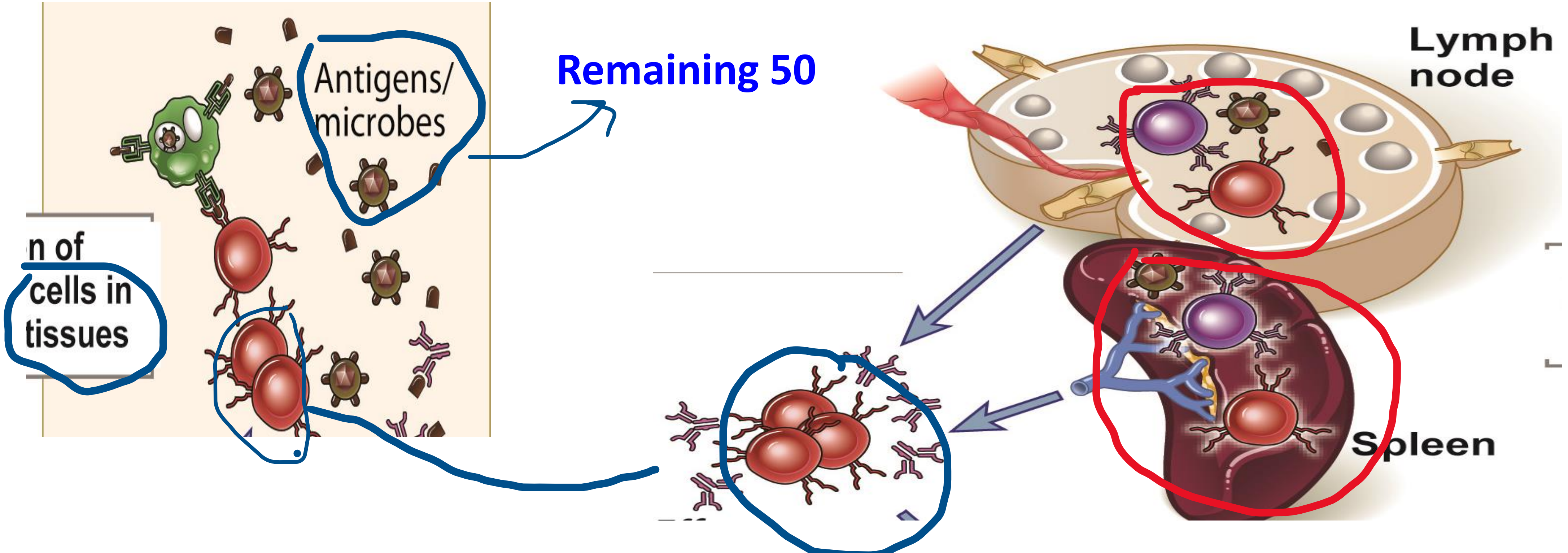
II) 2ry (peripheral) lymphoid organs

Lymph node

Spleen

2) Initiation of adaptive immune response :

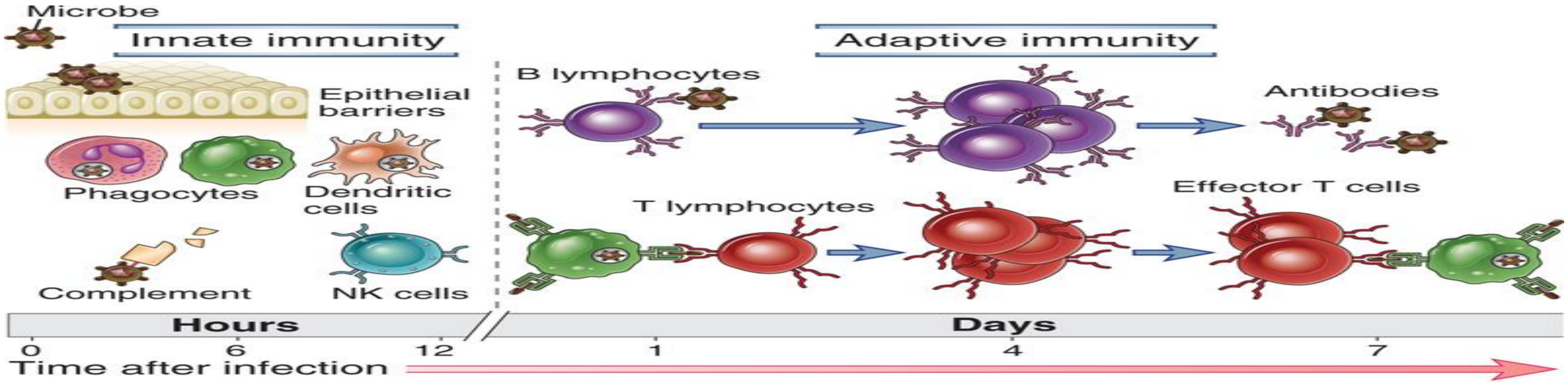
Site of⊕ of mature B & T lymphocytes



Remaining 50

COMPARISON BETWEEN INNATE & ADAPTIVE IMMUNITY

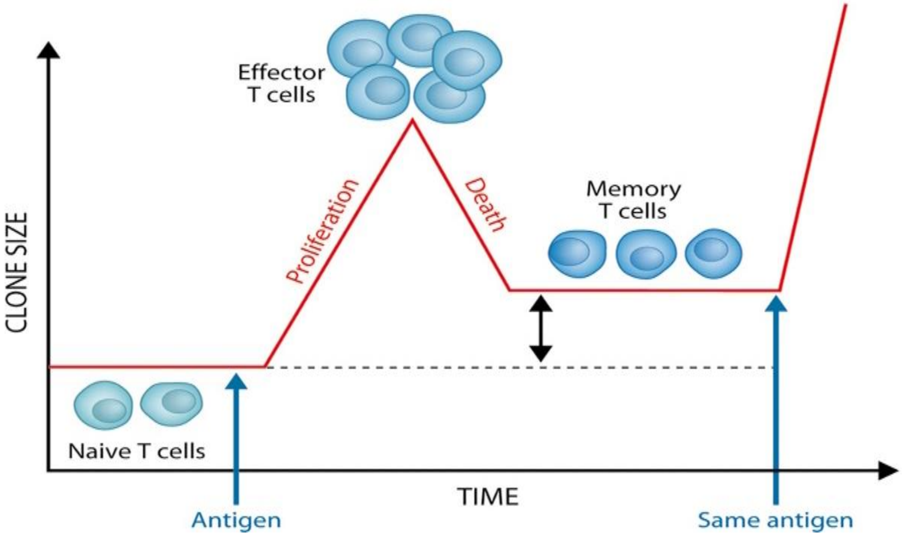
	Innate (Natural) immunity	**Adaptive (Acquired) immunity**
Time of action	Responds **immediately** : **1st line of defense** (early , initial protection)	- **Takes time** (few days) **to be stimulated by Ags into effector cells** ↓ Provides protection when **innate immunity fails to eradicate** infection

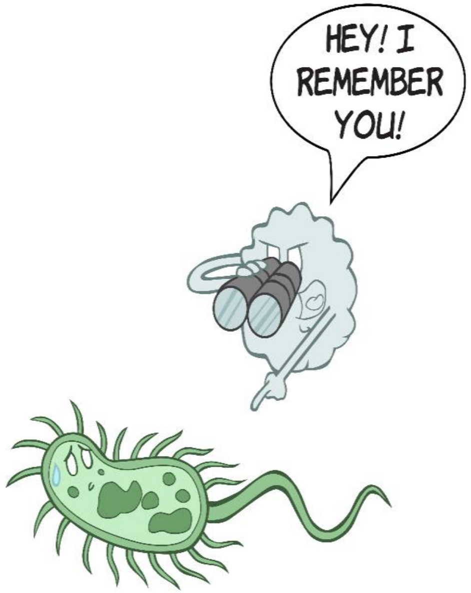


COMPARISON BETWEEN INNATE & ADAPTIVE IMMUNITY

➲ Characteristics

	Innate (Natural) immunity	Adaptive (Acquired) immunity
Memory On reinfection with same microbe	- **Absent** : - **responds with same intensity**	- Present ➥ Stronger & faster response due to memory cells




HEY! I REMEMBER YOU!

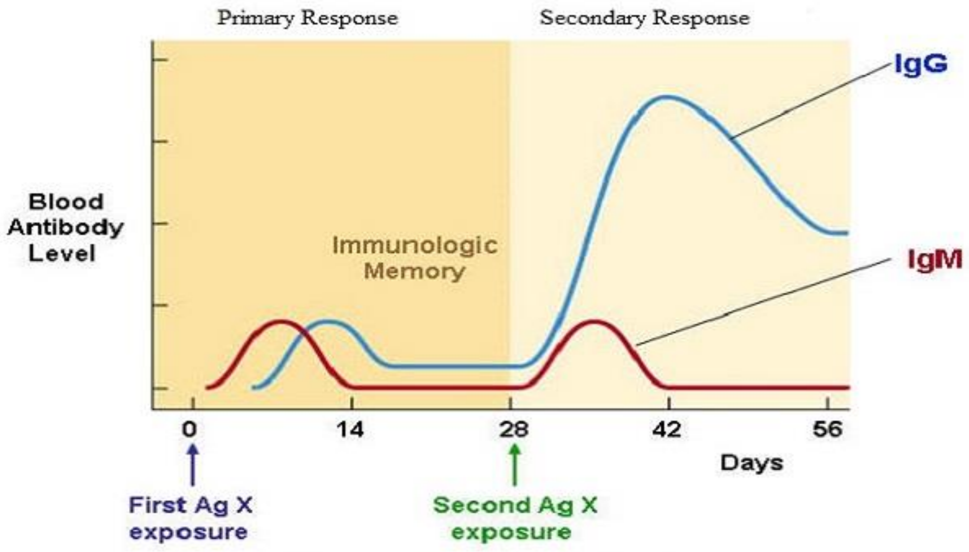
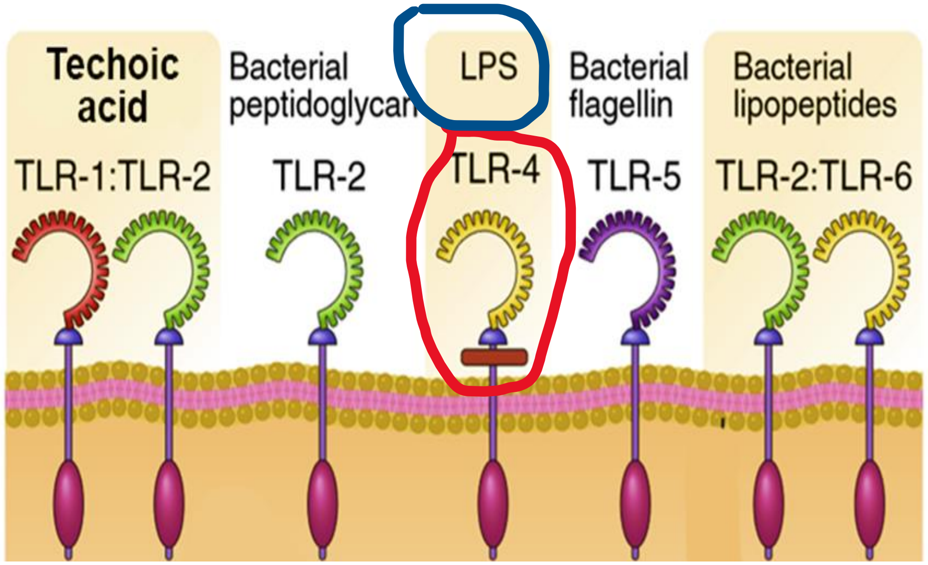


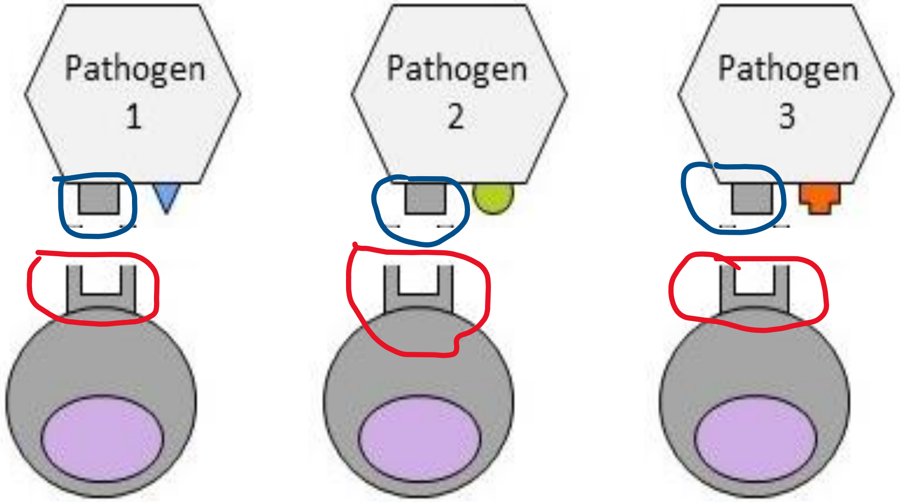
Fig. Immune Response and Secretion of antibodies

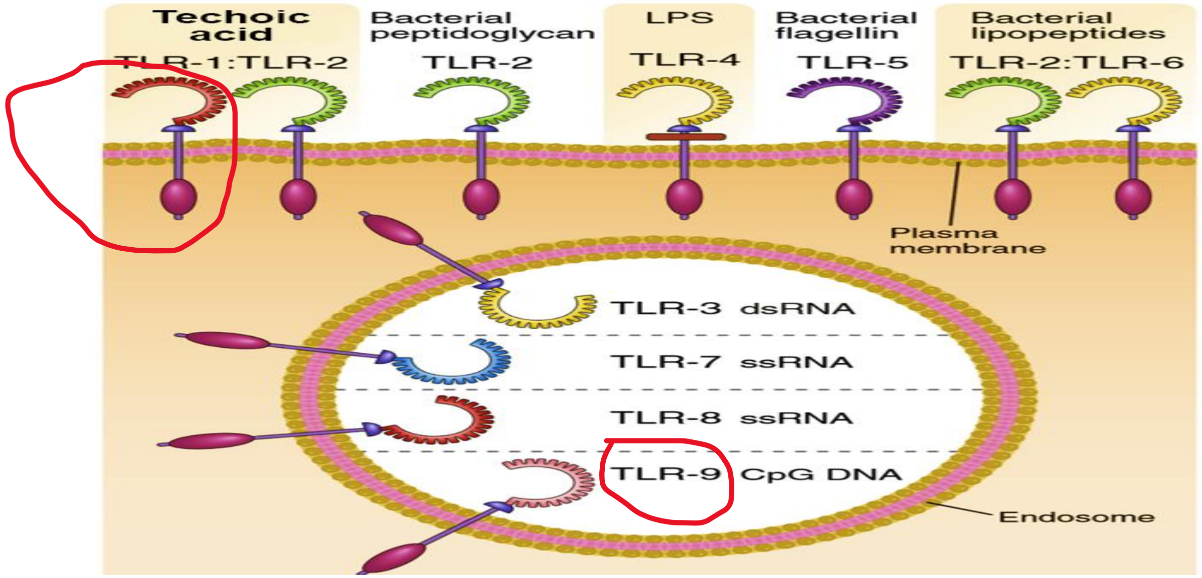
COMPARISON BETWEEN INNATE & ADAPTIVE IMMUNITY

	Innate (Natural) immunity
Specificity	**Limited** ↓ React to structures common to many microbes (PAMPs)

Toll –like receptors recognize PAMPs





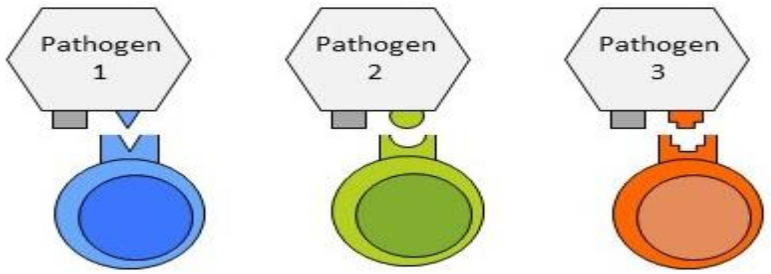


COMPARISON BETWEEN INNATE & ADAPTIVE IMMUNITY

➲ Characteristics

	Adaptive (Acquired) immunity
Specificity	**High** Each B & T cell clone has a **unique receptor** reacting only with **its specific Ag** **(Epitope)**

Adaptive immune system



Lymphocyte Antigen Receptor (AR)